CLAIMS

What is claimed:

1. An apparatus for examining cardiovascular tissue of a patient comprising:

an x-ray radiation source emitting radiation which is directed through cardiovascular tissue;

a scintillator receiving radiation transmitted through the tissue and generating an optical signal in response to the received radiation;

a non-reducing optical coupler that receives the optical signal;

a binning image sensor to receive the optical signal from the optical coupler at a plurality of pixels and generate an electronic representation of the tissue; and

a controller that is electrically connected to the imaging sensor, the controller actuating readout of the electronic representation from the imaging sensor.

2. The apparatus of claim 1 further comprising a display for displaying an image of the cardiovascular tissue.

3. The apparatus of claim 1 further comprising a display for displaying an image of the soft tissue, and a data processor receiving the electronic representation of the soft tissue and processing the image of the soft tissue on the display.

4. The apparatus of claim 1 wherein the image sensor comprises a charge coupled device (CCD) that includes a plurality of interpixel channels.

5. The apparatus of claim 1 further wherein the CCD comprises a plurality of CCDs, each CCD having a plurality of surfaces which interface with an adjoining CCD.

6. The apparatus of claim 1 further comprising a processor programmed to correct a seam artifact.

7. The apparatus of claim 1 further comprising a frame holding the radiation source and the imaging sensor in fixed relation to each other.

8. The apparatus of claim 1 wherein the imaging sensor has a first plurality of pixels having a first size and a second plurality of pixels having a second size that is different from the first size.

9. The apparatus of claim 1 further comprising a processor that combines data stored by groups of adjacent pixels of the imaging sensor to generate the electronic representation of the cardiovascular tissue.

10. The apparatus of claim 1 further comprising an audio controller, such that the audio controller actuates a procedure.

11. The apparatus of claim 1 wherein the imaging sensor performs time delay integration to generate the electronic representation of the cardiovascular tissue.

12. The apparatus of claim 1 wherein the imaging sensor comprises an array of pixels at least as large as 2048 x 2048 pixels.

13. The apparatus of claim 1 further comprising a straight fiber optic coupler between the optical surface and the imaging sensor.

14. The apparatus of claim 1 wherein the scintillator has a variable thickness.

15. The apparatus of claim 1 wherein the controller bins rectangular groups of pixels during charge readout.

16. The apparatus of claim 1 wherein the sensor performs pixel binning.

17. An apparatus for determining of a cardiac diagnostic characteristic of a patient comprising:

an x-ray radiation source emitting radiation which is directed through a patient;

a scintillator receiving x-ray radiation transmitted through the tissue and generating an optical signal correlated with the received radiation and directing the optical signal along a first optical path;

a plurality of abutting charge coupled devices (CCD) that are optically coupled to the scintillator to receive the optical signal at a plurality of pixels and generate an electronic representation of the soft tissue;

a fiber optic coupler positioned between the scintillator and the CCDs;

a controller that is electrically connected to the CCDs such that the controller bins charge from separate pixels to form an electronic representation of a region of interest of the patient to diagnose a characteristic.

18. The apparatus of claim 17 wherein the cardiac diagnostic characteristic includes one of ejection fraction, degree of stenosis or stent position.

19. A method of three-dimensional imaging of cardiac tissue in a patient comprising:

providing an x-ray radiation source such that radiation emitted by the source is transmitted through a patient's cardiac tissue onto a scintillator;

providing a plurality of abutting silicon circuit sensors, each sensor having a two dimensional array of pixel elements that detect light from the scintillator that is emitted in response to radiation from the x-ray source;

positioning the patient on a support surface;

directing x-ray radiation through the region of the patient's cardiac tissue onto the scintillator which emits a spatial intensity pattern of light that is detected by the sensors, the spatial intensity pattern being coupled to the sensors with an optical system;

binning charge from separate pixel elements of the sensors for readout with an electronic controller; and

forming a three-dimensional image of the cardiac tissue from the binned representation.

20. The method of claim 18 wherein the step of providing a pixellated sensors comprises providing a plurality of binnable sensors.

21. The method of claim 18 further comprising providing data processor connected to the sensors, the data processor having a memory for storing a discrete electronic representation.

22. The method of claim 18 wherein each silicon circuit sensor has a plurality of interpixel channels.

23. The method of claim 18 further comprising providing a fiber optic coupler between the scintillator and the sensors.

24. The method of claim 18 further comprising forming the image in less than 60 seconds after directing the x-ray radiation through the patient.

25. The method of claim 18 further comprising simultaneously irradiating an entire region of the patient with x-ray tube that is stationary relative to the patient.

26. The method of claim 18 further comprising forming an image having a resolution of at least about 1 mm.

27. The method of claim 18 further comprising providing a sensor having a two dimensional array of MOS capacitors.

28. The method of claim 18 further comprising performing serial and parallel binning of pixels of each sensor.

29. The method of claim 18 further comprising binning pixels during charge readout of the sensors.